

Implementation of NLX Supplemental Audio and the Audio/Modem Riser

Phil Lehwald
Intel Corporation
BDO / OPSD Engineering
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Overview/Scope

The Audio/Modem Riser (AMR) Specification is an industry specification that establishes a standard way for implementing audio and modem functions on a single motherboard riser module. While it is possible to have both an AMR module and audio down on the motherboard in the same design, an AMR module with no audio down is the most cost effective, from a skew management perspective. This white paper describes a method of implementing the AMR module into an NLX design that does not have audio down on the motherboard.

It is not the intent of this paper to provide detailed information on the AMR or the NLX form factor specifications. For more information see the latest revisions of the following specifications:

1. *Audio/Modem Riser Specification* (available at <http://developer.intel.com/pc-supp/platform/ac97/>)
2. *NLX Motherboard Specification* (available at <http://www.teleport.com/~nlx/>)

Problem Statement

Unlike the ATX and micro ATX form factors, the NLX form factor has two basic components - the NLX Motherboard and the NLX Riser. Connection between the two is made via the NLX edge connector. The key difference between the ATX, micro ATX, and NLX form factors is that the NLX form factor has the option of supporting both front panel line-output and microphone input (via jacks on the NLX Riser). The functionality of these jacks is identical to their rear panel counterparts with the added functionality of the rear panel jacks being disabled when the front panel jacks are in use (for example, when headphones are plugged into the front panel line-out jack, the rear panel line-out jack is disabled). The signals necessary to support this type of functionality are not part of the AMR connector pinout. In order for this functionality to be successfully implemented between an AMR module and an NLX Riser, the required signals must be connected via a supplemental connector. This paper defines a standard connector pin-out for implementing the NLX supplemental audio signals between an AMR module and the NLX Riser.

Solution

In order to fully implement the NLX front panel audio functionality, the following five signals must be implemented between the AMR module and the NLX Riser:

- ***FP_MIC_EN*** – *Input to Audio Modem Riser module* – Indicates whether a microphone has been plugged into the front panel MIC jack. The signal is connected to a wiper on the front panel microphone jack and is high (digital supply voltage) when a microphone is plugged in. ***FP_MIC_EN*** is set low (0 volts) when a microphone is not plugged in. This signal is pulled low (0 volts) through a pull-down on the motherboard (typically less than 100k). For more information see the ***NLX Motherboard Specification***.
- ***FP_SPKR_EN*** – *Input to Audio Modem Riser module* – Indicates whether headphones have been plugged in to the front panel line-out jack. The signal is connected to a wiper on the line-out jack and is high (digital supply voltage) when speakers or headphones are plugged in to the front panel line-out jack. ***FP_SPKR_EN*** is set low (0 volts) when nothing is plugged in to the front panel line-out jack. This signal is pulled low (0 volts) through a pull-down on the motherboard (typically less than 100k). For more information see the ***NLX Motherboard Specification***.

- ***L_LINE_OUT*** – *Output from Audio Modem Riser module* – This signal is a line-level output that comes from the AMR module left channel line output (typically the audio CODEC) and goes to the NLX Riser output amplifier input. This signal is nominally 1.0 Vrms. For more information see the ***NLX Motherboard Specification***.
- ***R_LINE_OUT*** – *Output from Audio Modem Riser module* – This signal is a line-level signal that comes from the AMR module right channel line output (typically the audio CODEC) and goes to the NLX Riser output amplifier input. This signal is nominally 1.0 Vrms. For more information see the ***NLX Motherboard Specification***.
- ***NLX_RISER_MIC*** – *Input to Audio Modem Riser module* – This signal comes from the NLX Riser microphone preamplifier. It would typically be connected to an analog MUX located on the AMR module. This signal is nominally 1.0 Vrms. For more information see the ***NLX Motherboard Specification***.

Supplemental Audio Header

Figure 1 shows the recommended pin-out of a 2x5 header. This header can then be used to cable the supplemental audio signals from the AMR module to the NLX Riser via a standard 9-conductor ribbon cable. Note that the signals are positioned within the header to minimize crosstalk between the audio signals. In addition, a key pin is provided to prevent incorrect installation of the connector.

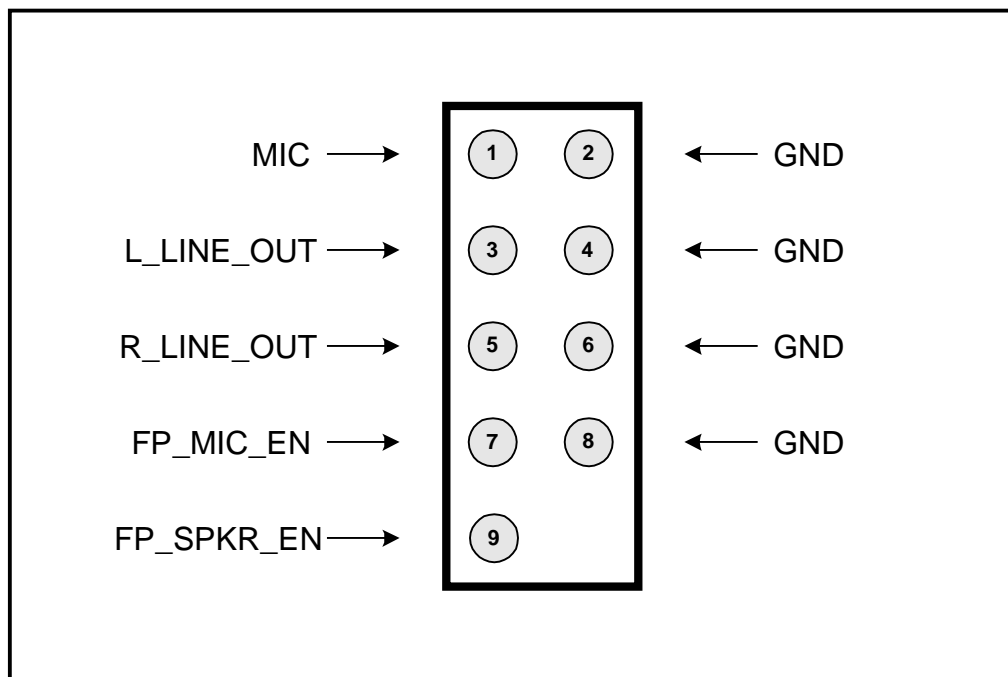


Figure 1. Supplemental Audio Header.

Line Output Signal Control Implementation

Figure 2 shows one possible implementation of the front and rear panel line-out. When the front panel line output is not used, the wiper is pulled to ground, turning Q1 (on NLX Riser) off and Q2 (on AMR module) on. This results in the front panel line output (U5 and U6) being muted and the rear panel line output (U7 and U8) being unmuted.

When a jack is plugged in to the front panel line output, the wiper opens, and the input of U1 is pulled high, causing Q1 (on NLX Riser) to turn on and Q2 (on AMR module) to turn off. The result is that the front panel amp is unmuted and the rear panel amp is muted.

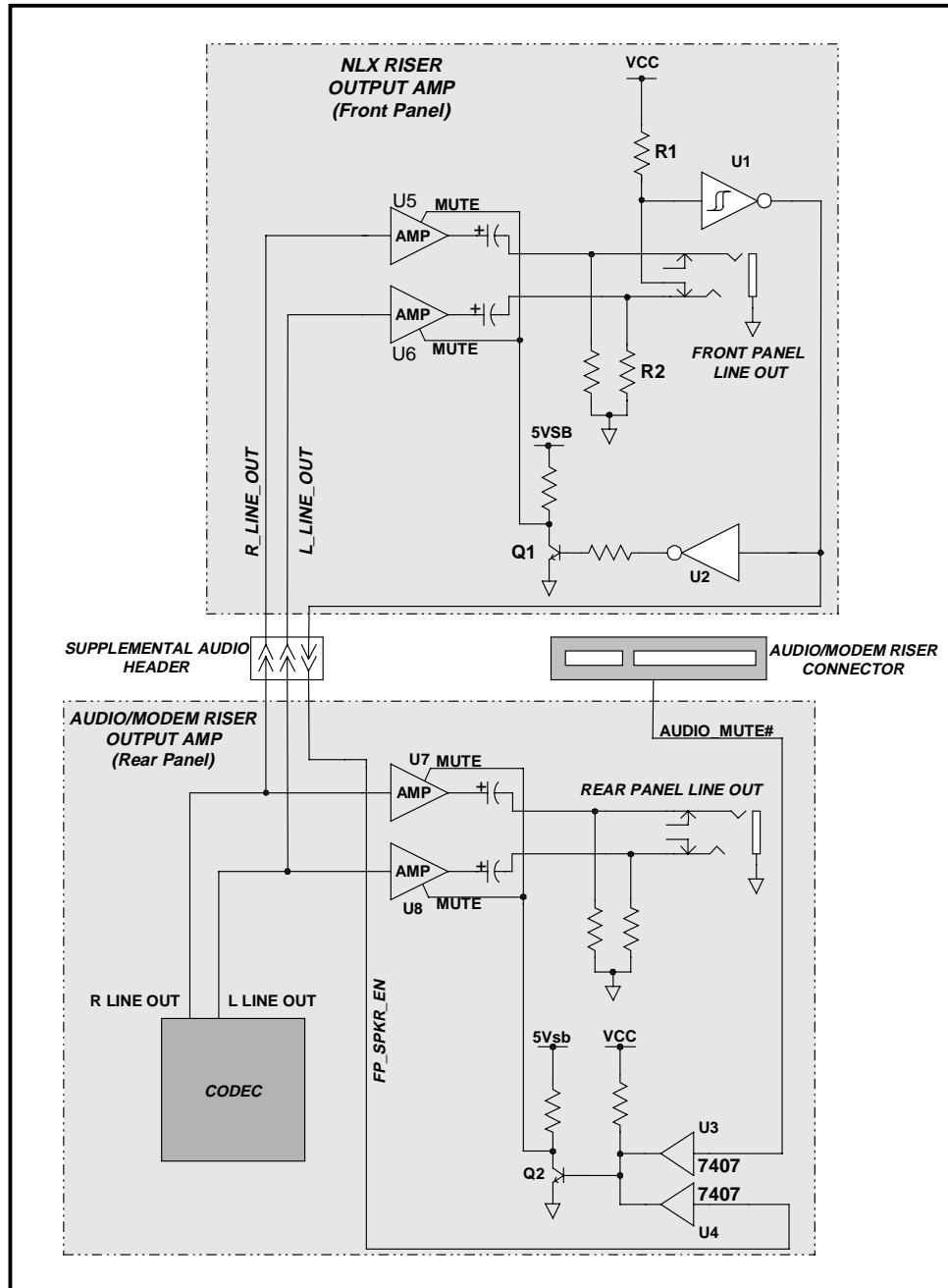


Figure 2. Line Out Signal Control Implementation.

Also note that the MUTE pins on the amplifiers are pulled up to 5VSB. Doing so aids in reducing power-on transients, due to the fact that the amplifiers power up in a muted state. **Note: the front panel jack always overrides the rear panel jack.**

Microphone Signal Control Implementation

Figure 3 shows a block diagram of one possible solution to control the microphone input signal. When the front panel jack is not in use, the jack sense circuit sets the FP_MIC_EN signal low (0 volts). The signal passed to the CODEC is from the rear panel microphone preamplifier. When the front panel jack is in use, the jack sense circuit sets FP_MIC_EN high (digital supply voltage), causing the analog mux to pass the NLX Riser microphone preamplified signal. **Note the front panel jack always overrides the rear panel jack.**

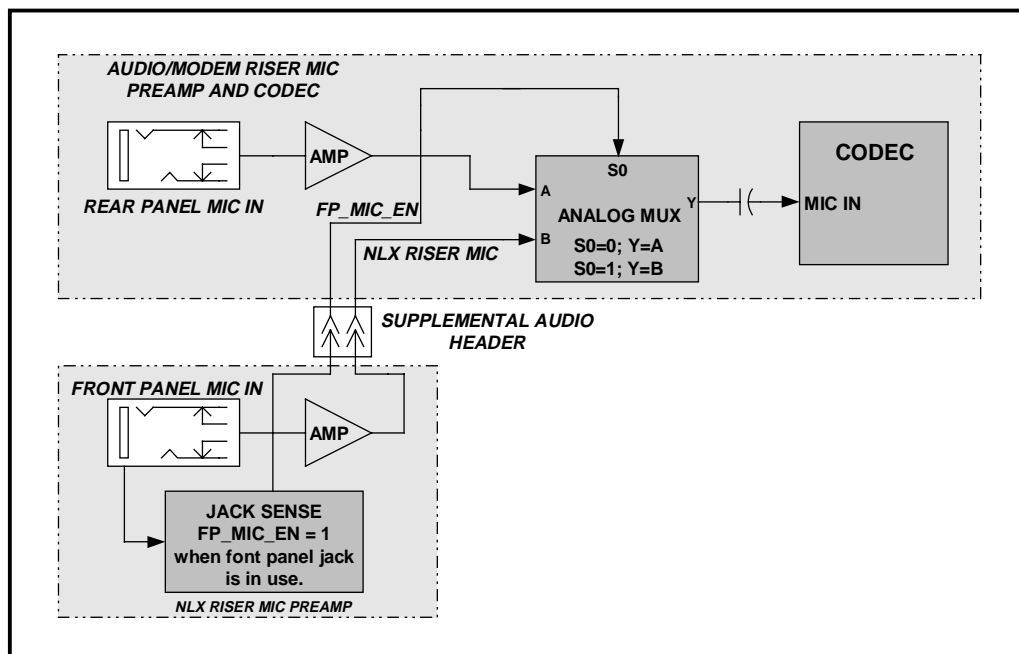


Figure 3. Mic input signal control implementation.

Conclusion

The recommended solutions specified above facilitate a clean and simple method of implementing an AMR and the NLX supplemental audio signals. The components shown are readily available, industry-standard components, making them an excellent choice from a price perspective. The most compelling advantage to the solution above is that it facilitates a standard method of implementation that makes it easier for systems manufacturers and AMR module vendors to work together.